

ABSTRACT

A single-stage refrigerating system includes a compressor, a condenser, an evaporator, and a heat exchanger for exchanging heat between a refrigerant in a path from the evaporator to the compressor and a refrigerant in another path from the condenser to the evaporator, and a non-azeotropic refrigerant mixture used in the system. The refrigerant mixture is a combination of a refrigerant having a normal boiling point of approximately room temperature and a low-boiling-point refrigerant having a normal boiling point below -60°C . A dew point of the refrigerant mixture at a pressure in the condensing process after the compression is above room temperature. The boiling point is higher than the dew point at a pressure in the lower-pressure region in a path from the evaporator to the compressor. The combination may include butane or isobutane as the high-boiling-point refrigerant component having a normal boiling point of approximately room temperature and having a low evaporating pressure and ethane or ethylene as the low-boiling-point refrigerant component suitable for achieving ultra-low temperature.